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Double Trait Assessment Test Battery for Air Force Pilots

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Building on years of theoretical discussions as well as diagnostic experience in the Polish Air Force Institute of Aviation Medicine, a battery of psychological tests was proposed for the assessment of the general aptitude of pilots. This battery should be suitable both for the candidates for the airforce service and for the routine assessment of the active pilots. Moreover, which is probably most difficult, the battery of tests should also be useful in the assessment of pilots in special circumstances, for example after accidents, illnesses as well as for the assessment of pilots who undergo psychological evaluation for other reasons.

Formal assumptions for the construction of the test battery

1. Personality traits, which are essential for pilots have to be estimated without using self-description techniques or tests based on projection.
2. Tests should be resistant to subjects' manipulation.

These two assumptions stem from the nature of diagnosis in the selection situation. Most of the persons who undergo evaluation have their own concrete expectations and motivations. Some of them want to show themselves from their best side and hide their problems, while others on the contrary, try to obtain the worst possible results, for example in order to be granted the highest reimbursement after an accident.

3. Each trait should be estimated independently by two separate tests.

This last assumption allows to improve objectivity of the assessment and to make the falsification of the results by a subject even harder. What is even more important, it increases the probability of discovering the latent variables underlying a particular test result. In other words, if the result in one test is low, the hypothesis about the decreased functioning of a corresponding cognitive or motor mechanism may be further verified on the basis of another, independent method. Since worsening of the results on one test may stem from many factors, the method used by the battery of tests allows formulating diagnoses that are more reliable and valid.

4. Only relatively narrowly defined cognitive and psychomotoric abilities will be assessed by the test battery. A qualified psychologist will conduct the integration of data to form a general evaluation of subject's traits and his suitability for the profession of a pilot in the process of the detailed analysis of the results.

The analysis of relevant literature and our own experiences do not encourage the construction of mechanically administered global indices. The research and evaluation procedure that is employed gives maximum information to the psychologist, but the interpretation of the results or the decision about the continuation of the assessment with additional methods has to be made by the psychologist him/herself.

The assumptions pertaining to the investigated variables.

It is generally expected that a pilot is characterized by a large span of working memory (especially a visuo spatial sketch pad), a good balance between speed and accuracy of actions, tolerance to the situational stress, the ability

to divide attention in a multi element, complex environment, reasonable risk-taking, tolerance for monotonous conditions and the ability to judge time properly, especially in connection with judgments of distance.

Some of the variables mentioned above should take values close to maximum (e.g. a good stress tolerance, large working memory span); others should take values from the optimal range.

Most variables investigated are orthogonal, which means that their correlations are close to zero. Therefore, only a small group of persons can achieve high scores in all the tests. The overall evaluation does not mechanically follow from the results obtained but is left for the diagnostician to decide.

Relations between the variables investigated and the applied test methods are depicted in figure 1:

As an example, we present a test of three-dimensional pursuit tracking. The test consists of moving a cross on the screen in such a way that it covers all the time a moving square. The square can also change its size. An additional task for the subject is to react to triangles, which appear, among other geometrical figures, on the peripheral part of the screen.

The accuracy of the position of the cross is recorded as well as the reaction time and the number of errors in the additional task. A schema of the experimental situation is presented in Figure 2. The computer program used for this task enables modification of the difficulty of the path on which the pursued object moves. Subjects are given the opportunity to practice the task before the actual test. According to the schema presented, the results of the test are informative about the span and divisibility of attention resources, as well as the effect of difficulty on the quality of performance on the task.

The general score, i.e. the accuracy of matching of the pursuing object to the moving object, estimates the magnitude of attention resources. Particularly significant is the quality of performance on the secondary tasks: the setting of the object's size and the reaction to additional stimuli. The difference between performance on easy and difficult tasks can, in turn, be an indicator of reactive stress management.

In order to verify the hypotheses about the above mentioned traits of a pilot we have to take into account also other tests. The resilience of an individual to a reactive stress can also be evaluated by another test, which requires guiding an element on a predetermined path. In this task a distracter is a loud sound, which signifies that the object has gone off the path. Also here the results obtained on paths which differ in difficulty are compared.

The model presented has a heuristic rather than algorithmic character. Its main characteristic is that the diagnosis is based on more than one test and that in the process of evaluation a psychologist plays an active role in order to find solutions that are maximally reliable and valid. The organization of the laboratory (see Figure 3), allows for an easy administration of tests and for obtaining the results quickly, thus the role of a psychologist boils down to the analysis of the results, stating and verifying of diagnostic hypotheses and formulation of the overall diagnosis.

At the present moment all the tests that are included in the battery have been analyzed in term of their validity, reliability, normalization and standardization. Now we are working on the evaluation of the validity of methods when used jointly, as a battery.

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